SEMESTER END EXAMINATION, DECEMBER 2024

Course Name: - B.Tech. **Semester:- III**

Paper Name: - Digital Electronics **Paper Code:- TES-301**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. Max Marks-70 +20

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं सह लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70 + 20

Instructions:

- The question paper consists of four sections namely A, B, C,D. All sections are compulsory.
- Section A- Each question carries **3 mark**. **All questions are compulsory**.
- Section B- Answer any **5 out of 7** given questions. Each question carries **7 marks**.
- Section C- Answer any **2 out of 3** given questions. Each question carries **10 marks**.
- Section D- Each question carries **2 mark**. **All questions are compulsory**.

निर्देश:

- प्रश्न पत्र में चार खण्ड अ, ब, स, द हैं। सभी खण्ड अनिवार्य हैं।
- खण्ड–अ में प्रत्येक प्रश्न **तीन अंक** का है। **सभी प्रश्न अनिवार्य हैं।**
- खण्ड–ब में **सात प्रश्नों में से किन्हीं पाँच** प्रश्नों के उत्तर दें। प्रत्येक प्रश्न **सात अंक** का है।
- खण्ड–स में **तीन प्रश्नों में से किन्हीं दो** प्रश्नों के उत्तर दें। प्रत्येक प्रश्न **10 अंक** का है।
- खण्ड–द में प्रत्येक प्रश्न **दो अंक** का है। **सभी प्रश्न अनिवार्य हैं।**

Section – A (खण्ड–अ)

Objective Questions (वस्तुनिष्ठ प्रश्न)

1. Answer all the following questions. 5x3 =15

निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) Synchronous counter is a type of _____

a) SSI counters
b) LSI counters
c) MSI counters
d) VLSI counters

ii) Complement of the expression A'B + CD' is _____

a) (A' + B)(C' + D)
b) (A + B')(C' + D)
c) (A' + B)(C' + D)
d) (A + B')(C + D')

iii) Find the value of radix 'x' if $(214)_x = (140)_{10}$:

a) 7
b) 8
c) 9
d) 6

iv) The given hexadecimal number (1E.53)16 is equivalent to _____

a) (35.684)8
b) (36.246)8
c) (34.340)8
d) (35.599)8

v) The number of comparators in 4-bit flash ADC is

a) 5
b) 4
c) 16
d) 15

Section – B (खण्ड–ब)
Short Answer Questions (लघुउत्तरीय प्रश्न)

2. Answer any five of the following questions. **5x7=35**
निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर दें।

i. What is magnitude comparator? Design and explain a two bit comparator using logic gates.

ii. What is K – map? Obtain the minimal SOP expressions of the following function and design output of K-Map by NAND gates.

$$F(A,B,C,D) = \sum m(0,1,3,5,6,11,14) + D(2,15)$$

iii. What are the digital logic families? Write its characteristics and importance?

iv. Obtain the minimal expression using Quine-McCluskey method.

$F(A,B,C,D) = \Sigma m(1,2,3,5,7,8,9,11,14)$

v. Explain the concept of complements in digital logic. Solve the -46_{10} and $+28_{10}$ by 2's complement.

vi. Explain R-2R ladder D/A converter. If a four bit R-2R ladder D/A converter has the digital input of 1011, then find the analog output for the given input. Given V_{ref} =5 volt and R_f = 2R.

vii. What are PAL & PLA Design? Implement the following Boolean expression with the help of PLA

$$X = AB + A\bar{C}$$

$$Y = A\bar{B} + BC + A\bar{C}$$

viii. Explain Memory organization ant its operation.

Section – C (खण्ड–स)
Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question. **2x10=20**
निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर दें।

i) What is difference between asynchronous and synchronous counter? Design and explain synchronous Decade counter.

ii) What is a combinational circuit and how is it different from a sequential circuit? Design and explain full adder using two half adder and one OR gate.

iii) What are excitation tables and characteristic tables in the context of flip-flops? Provide the excitation table and characteristic table for all flip-flops.

Section – D (खण्ड–द) (Mid Semester Test)

Objective Questions (वस्तुनिष्ठ प्रश्न)

1. Answer all the following questions. 10x2 =20
निम्नलिखित सभी प्रश्न अनिवार्य हैं।

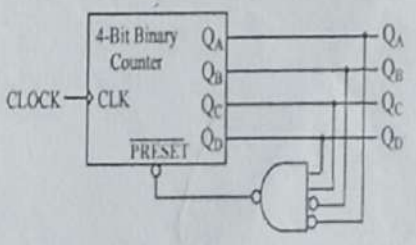
i) Memory is a/an _____
   a) Device to collect data from other computer
   b) Block of data to keep data separately
   c) Indispensable part of computer
   d) Device to connect through all over the world

ii) Race condition occur in .....
   a) Level Triggered S-R Flip Flop
   b) Level Triggered J-K Flip Flop
   c) Edge Triggered J-K Flip Flop
   d) Edge Triggered D Flip flop

iii) Which one of the following is not correct?
   a) $\overline{P \oplus Q} = P \odot Q$
   b) $\bar{P} \oplus Q = P \odot Q$
   c) $\bar{P} \oplus Q = P \oplus Q$
   d) $(P \oplus \bar{P}) \oplus Q = (P \odot \bar{P}) \odot \bar{Q}$

iv) Which of the following combinations of logic gates can decode binary 1101?
   a) One 4-input AND gate
   b) One 4-input AND gate, one inverter
   c) One 4-input AND gate, one OR gate
   d) One 4-input NAND gate, one inverter

v) A synchronous binary up-counter with synchronous preset input is shown in the figure where QA is MSB bit and QD is LSB bit. The sequence of counter is



   a) 0-1-2-3-0-1-2....
   b) 0-1-2-3-F
   c) 0-1-2-3-F-0-1-2-3-F.....
   d) 0-1-2-F-0-1-2-F-0.....

vi) The octal number (651.124)8 is equivalent to _____
   a) (1A9.2A)16
   b) (1B0.10)16
   c) (1A8.A3)16
   d) (1B0.B0)16

vii) On subtracting (01010)2 from (11110)2 using 1's complement, we get _____
   a) 01001

b) 11010
c) 10101
d) 10100

viii) Canonical form is a unique way of representing _____
a) SOP
b) Minterm
c) Boolean Expressions
d) POS

ix) The number of transistors are used by 2 input NOR gate is _____ in RTL logic Family.
a) 2
b) 3
c) 4
d) 5

x) The maximum number of digital input that the output of a single logic gate can feed and gate must be same logic family is called.....
a) Fan In
b) Fan Out
c) Noise Margin
d) Propagation Delay